Abstract Submitted
for the GEC13 Meeting of
The American Physical Society

Influence of outgassing on plasma kinetics during wood treatment in dielectric barrier discharges at atmospheric pressure R. GANGWAR, O. LEVASSEUR, L. STAFFORD, Universite de Montreal, Montreal (Canada), N. NAUDE, N. GHERARDI, LAPLACE - Toulouse (France), UNIV. DE MONTREAL TEAM, LAPLACE, FRANCE TEAM — We have recently extended the range of applications of dielectric barrier discharges (DBD) at atmospheric pressure to the functionalization of wood surfaces with the objective of improving its durability following natural weathering. Having highly complex chemical composition and microstructure, it can release significant amount of impurities, which can play a crucial role on the plasma kinetics, and therefore on the process dynamics. The influence of wood outgassing on the physics driving DBD operated in nominally pure He was investigated using a combination of time-resolved optical emission spectroscopy (OES) and collisional-radiative (CR) modeling. For completely outgassed samples, the He I 588 nm-to-707 nm and 668 nm-to-728 nm line intensity ratios were relatively high early in the discharge cycle, decreased abruptly and then remained stable as the current increased and the discharge eventually extinguished. These results were correlated to a decrease of the electron temperature from about 1 eV early in the cycle to about 0.2 eV in the main discharge lifetime. As wood outgassing evolve, study revealed that the release of products (essentially air) from the wood substrate yields to an increase of the cycle-averaged electron temperature as well as to a significant quenching of He metastable atoms. Selected experiments in presence of trace amounts of N_2, O_2 and dry-air were also performed to better understand their respective roles.

Reetesh Gangwar
Universite de Montreal, Montreal (Canada)

Date submitted: 10 Jun 2013 Electronic form version 1.4